REMARKS

The Office Action of February 13, 2003 has been carefully considered.

Objection has been raised that the brief description of the drawings on page 9 does not contain a description of Figure 1, 1a or 1b. However, Applicants added such a description in the preliminary amendment filed concurrently with the application. Should that description not be adequate, Applicants will revise.

Objection has also been raised to claim 13 as failing to properly limit the subject matter of a previous claim. Claim 13 has now been replaced by new claim 32, reciting that the static injection part is made of *a plurality* of elements, thus limiting new claim 17.

Claims 1-16 have been rejected under 35 USC 112, 2nd paragraph, as being indefinite on a number of grounds. These claims have now been canceled and replaced by new claims 17-40 written in proper form for US practice.

In claim 21, the list of metals has been recited without use of the term "refractory." While iron and steel are not generally thought of a "refractory metals" they are in refractory in this embodiment since their melting points are much higher than those of the metals being treated with the claimed device, ie. aluminum, magnesium and their alloys.

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Nevertheless, the term "refractory" does not appear in order to avoid confusion.

Withdrawal of this rejection is requested.

Claims 1-15 have been rejected under 35 USC 102(b) over Montgrain, and claim 16 has been rejected under 35 USC 103 over Montgrain in view of Manabu.

Montgrain discloses a device and method for injection of gas bubbles into molten metal, the device including a static injection part made of an inert material defined at column 6, lines 23-32, and which may be graphite, cast iron, silicon carbide or other suitable refractory. Montgrain teaches that protrusions (nozzles) need to be used to reduce the size of the released bubbles and that the size of these bubbles is determined by the presence of edges on the nozzles used for emitting the bubbles. In that respect, Montgrain states that "the size of the gas bubbles in a sparging operation may be reduced... by emitting gas from a plurality of spaced gas orifices, which are surrounded by a surface of limited dimensions to control the size of the emitted gas bubbles" (col. 2, lines 32-39) and "the bubble size is related to the cross-section of the top of the protrusion" (Col. 2, lines 51-52).

Montgrain never mentions the wettable (or non-wettable) character of the materials used for the nozzles and fails to

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recognize that this can affect the size of the bubbles. Thus, there is no specific disclosure in Montgrain of the wettability characteristics of the injection part.

New claims 17, 34 and 37 specifically recite that the static injection part is made of a material wettable by the liquid metal. The use of such wettable materials enables one to control the size of the bubbles irrespective of the size and shape of the part that supports the emission orifices.

The invention as claimed is not anticipated by the disclosure in Montgrain of graphite and silicon carbide, which are non-wettable materials. Cast iron (col. 6, lines 26-27) is not one of the possible wettable materials listed in the present specification, and Applicants believe that this material is probably non-wettable. In any case, Montgrain does not teach that the liquid metal will wet these materials.

Applicants disagree with the statement in the Office Action that the use of non-wettable materials provides a spreading ratio within the recited limits.

Indeed, for such materials the bubbles easily spread over the surface that surrounds the emission orifices. As indicated in Montgrain, they spread until they meet the edges of the nozzles (and even tend to "climb down" the sides of the nozzles, a main concern in this reference; see col. 3, line 62, to col. 4, line 42). Therefore, the spreading ratio does

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not necessarily fall within the limits set forth in Claim 17 since this depends on the dimension of the nozzle.

The only numerical values provided by Montgrain relate to a non-wettable material, specifically graphite. In that case, the bubbles would spread until they meet the edge of the nozzle. Since the diameter of the nozzle is 5 mm and the diameter of the orifice is between 0.5 mm and 1 mm (col. 3, lines 18-20), the spreading ratio is between 5 and 10 (i.e. 5 mm divided 0.5 mm or 1 mm). Thus, the lower limit of the range of values for the spreading ratio that can be inferred from Montgrain, and which relates to a non-wettable material, is above the upper limit for the spreading ratio indicated in present claim 1, which is less than 5.

Hence, claims 17 and 37 distinguish over Montgrain in that they relate solely to wettable materials and recite a spreading ratio smaller than the smallest value explicitly disclosed in Montgrain.

Actually, the use of wettable materials leads to spreading ratios much smaller than 5 and usually close to 1, since the diameter of the contact area is equal to the diameter of the emission orifice for perfectly wettable materials. Moreover, the spreading ratios recited in claims 18, 19, 38 and 39 of 3 and 1.5 are clearly distinguished from the disclosure of Montgrain.

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Manabu has been cited only in respect of the use of X-rays to determine bubble size. Manabu does not disclose or suggest that bubble size is related to the nature of the nozzle material, and does not disclose or suggest the use of a wettable material to control bubble size.

Withdrawal of these rejections is requested.

In view of the foregoing amendments and remarks, Applicants submit that the present application is now in condition for allowance. An early allowance of the application with amended claims is earnestly solicited.

Respectfully submitted,

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